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$$A=\tfrac{1}{2}\int_0^{\frac{1}{2}\pi}\sin^{-\frac{1}{2}}\phi\,\cos\phi\,d\phi=\tfrac{1}{4}B(\tfrac{1}{4},\ \tfrac{1}{2})=\tfrac{1}{4}\frac{\Gamma(\frac{1}{4})\ \Gamma(\frac{1}{2})}{\Gamma(\frac{3}{4})}=\tfrac{1}{4}\sqrt{(\pi)}.\frac{\Gamma(\frac{1}{4})}{\Gamma(\frac{3}{4})}.$$

In elliptic integrals, using Legendre's notation, $A=\frac{1}{2}\sqrt{(2)}F^I\ (\frac{1}{2}\sqrt{2})$ $=1.311029$.

Also solved similarly by James A. Whitted, and the Proposer.

304. Proposed by H. C. FEEMSTER, York College, York, Neb.

Reduce $axyp^2+(x^2-ay^2-b)p-xy=0$ to Clairaut's form, and hence solve the equation.

Solution by OLLINE CRUICKSHANKS, Bowling Green, Ky., and S. G. BARTON, Ph. D., Clarkson School of Technology, Potsdam, New York.

Expanding and factoring,

$$apy(px-y)+x(px-y)=bp,\quad (apy+x)(px-y)=bp. \tag{I}$$

Let $x^2=u$ and $y^2=v$. $\therefore 2xdx=du$ and $2ydy=dv$.

$$p=\frac{dy}{dx}=\frac{x}{y}\,\frac{dv}{du}.$$

Substituting this value of p in (I),

$$\left(\frac{x^2}{y}\,\frac{dv}{du}-y\right)\left(\frac{axy}{y}\,\frac{dv}{du}+x\right)=\frac{bx}{y}\,\frac{dv}{du}. \tag{II}$$

Multiplying (II) by y/x,

$$\left(x^2\,\frac{dv}{du}-y^2\right)\left(a\,\frac{dv}{du}+1\right)=b\frac{dv}{du}. \tag{III}$$

Since $x^2=u$ and $y^2=v$, (III) becomes

$$(u\frac{dv}{du}-v)(a\frac{dv}{du}+1)=b\frac{dv}{du}. \tag{IV}$$

$$\therefore v=u\frac{dv}{du}-\frac{b\dfrac{dv}{du}}{a\dfrac{dv}{du}+1}. \tag{V}$$

$$\therefore v=uc-\frac{bc}{ac+1};\ \text{but } v=y^2 \text{ and } u=x^2.\quad \therefore y^2=cx^2-\frac{bc}{ac+1}.$$

Also solved by A. H. Holmes, who substitutes for p, xz/y, and then differentiates the resulting equation.